## APPENDIX: IN STREAM LARGE WOODY DEBRIS RECRUITMENT POTENTIAL

### Introduction

This appendix contains two sections. The first section is a CWD recruitment potential assessment prepared using satellite imagery captured in 1993. The second section contains earlier assessments of CWD recruitment potential prepared for the initial round of watershed analysis documents that covered the subwatersheds in the North Fork Coquille Watershed.

### Coarse Woody Debris Recruitment Potential Analysis Using Satellite Imagery

**Methods Used to Do the CWD Analysis**

The instream coarse woody debris (CWD) recruitment potential analysis was done by reclassing Western Oregon Digital Image Product (WODIP) data. The WODIP vegetation data are satellite data captured by the Landsat Thematic Mapper in the summer of 1993. We reclassified the WODIP data following the streamside vegetation classification protocol in the Washington DNR's Riparian Function Assessment: Large Organic Debris Recruitment Module (Washington Forest Practices Board 1993). We departed from the DNR protocol for the following ways:

- The DNR protocol focuses on fish bearing streams. We expanded the analysis to include classifying CWD recruitment potential on 1st and 2nd order streams because debris torrents beginning on some of these streams can transport CWD to fish bearing streams. CWD recruitment to all 1st and 2nd order also provides structures to trap sediment and habitat complexity benefitting invertebrates that process fine organic material.
- We classified the vegetation 100 feet either side of the streams. The DNR protocol is to classify vegetation 66 feet either side of fish bearing streams. We used 100 feet because that approximates the resolution provided by the 30-meter by 30-meter pixel used in the WODIP data.
- Streams in GIS are lines and therefore have no width. This means the inner boundary of the vegetation classification strip, to either side of the stream, is the stream centerline. This contrasts with the manual method where the inner boundary is on the stream bank.
- The reclass options in WODIP do not directly correspond to the DNR class breaks. We approximated the DNR class breaks, using WODIP data as follows:

Table ISCWD-1: WODIP Reclass

| DNR classification component: | WODIP Reclass: |
|---|---|
| Size:<br>In western Washington, size class is approximated using age. We used the tree size classification, based on D.B.H., for eastern Washington.<br><br>DNR Young - D.B.H. <12"<br>DNR Mature - D.B.H. ≥12" and <20"<br>DNR Old - D.B.H. ≥20" | Size:<br>WODIP contains size classes but not age classes. The WODIP size classes do not directly match the DNR eastern Washington classes but they are close. We used the following reclass:<br>D.B.H. <10"<br>D.B.H. 10"-19"<br>D.B.H. 20"-29" & D.B.H. >30" |
| Density:<br>Density is sparse if more than 1/3 of the ground is exposed. | Density:<br>Crown closure from 5% to 65% = sparse.<br>Crown closure from 75% to 95% = dense |
| Vegetation Class:<br>70% conifer = conifer<br>70% hardwood = hardwood<br>All others = mixed | Vegetation Class:<br>66% + conifer = conifer<br>66% + hardwood = hardwood<br>All others = mixed |

WODIP Data Limitations (taken from the WODIP Guidebook):

The Landsat data has a pixel size of 30 by 30 meters. Any feature less than 30 meters across will probably not be identified in the imagery. Exceptions include features that are drastically different from their surroundings. Vegetation maps derived from satellite data strive to attain an overall accuracy of 80%. Some cover types have unique energy reflective properties that are easier to identify, and therefore are classified more accurately. Other land cover types have similar reflective characteristics, which leads to miss-classification. Examples of these cover types are agriculture fields and recent clearcuts, dense brush and small hardwoods. For additional information on

WODIP, see The WODIP Guidebook (Nighbert *et al.* 1997).

Data stratification:

0, 1st, and 2nd order streams

The steeper 0, 1st and 2nd order draws are source areas for pulses of CWD mixed with gravel, cobbles, rocks, and fines that enter the lower gradient streams as debris torrents and debris avalanches. These debris torrents and avalanches contribute CWD material that provides the woody structure in fish bearing streams. We did not have a ready means to distinguish steep gradient from low and moderate gradient streams. This is not an impossible task. However, we were running out of time and decided to leave that work for another time. Consequently, we are not able to complete an analysis to determine the most important sources of debris torrent/ debris avalanche delivered CWD. Knowing the CWD recruitment potential on the smaller order streams still has value in that CWD in these streams provides sediment traps and facilitates nutrient processing.

3rd order and larger streams

Stream side trees that fall into the 3rd, 4th, and to a lesser extent 5th order streams have a reasonablely good chance of staying within these systems and contributing to the CWD habitat. There are only a few reaches of 6th order and larger streams on BLM in this watershed. They are grouped with the 3rd to 5th order streams to simplify the analysis. The 6th order and larger streams have a low probability of retaining CWD that enter the streams individually or in small groups. These larger order systems are more likely to retain a large pulse input of CWD provided there are catch points where jams can accumulate.

Reliability/ suitability of using Landsat data and GIS to analyze CWD recruitment potential:

The strengths of using reclassed satellite data are:

- Computer analysis provides a consistent vegetation classification.
- The computer process is quicker than manual classification at the subwatershed and larger scales.
- For all practical purposes, the computer process requires no more time to class the vegetation next to all streams than it does to class vegetation next to fish bearing streams.
- Since the process is automated, vegetation is classifiable down to a 30 by 30 meter patch size. Conceptually, we can extract subsets from this data set based on what is considered the minimum size for an operational unit.

The limitations of using reclassed satellite data are:

- Clearcuts, brush fields, and other unforested lands are indistinguishable from very young plantations.
- Vegetation is classed in a zone that begins at the stream centerline. This is not a problem for 5th order and smaller streams in that the stream side forest canopy typically reaches out over and hides the stream from above. It also turns out that this was not a problem for 6th order and larger streams on BLM land in the North Fork Coquille Watershed. However, as a caution to people who may want to duplicate this analysis in other watersheds, this did present a problem when doing the CWD recruitment potential analysis in the South Fork Coos Watershed Analysis (USDI 2000). In that analysis, the 100-foot wide sampling of "streamside" data along the larger streams, in places, picked up the water surface and missed stream side vegetation. That necessitated compensating by classing vegetation 150-foot either side of the 6th order and larger streams, so to increase the vegetation sample size. This approach also increased the representation of roads, sidecast debris and other nonforest conditions in the data set.
- The down side of consistent vegetation classification afforded by a computer analysis is there little opportunity to practice "professional judgement" on a stand by stand scale. For example based on strict adherence to definitions, a pre-crown closure conifer plantation on a good site is classed as "high risk." A human classifier familiar with stand development would anticipate crown closure in the near future and classify the stand as "medium risk."
- Alders are indistinguishable from other hardwood species.
- Mixed stands, that average 10-inches dbh and larger, with a coarse textured mosaic patch pattern of conifers and hardwoods, are reflected in the imagery data as patches of either hardwood or conifer pixels in a matrix of the other forest type and not as pixels with a mixed stand signature. Therefore, the satellite imagery under estimates acres of mixed stands compared to visual classification using aerial photographs.
- The acres of stream side forest next to 2nd order and smaller streams are overestimated because the "buffer" command used to select data within 100 feet of 2nd order and smaller streams also captured data where the 2nd order and smaller streams were within 100 feet of third order and larger streams.

In a previous analysis, we found differences in how streamside vegetation was classified when we compared the computer CWD analysis with the manual analysis (USDI 2000). The differences are attributable to the difficulties of

making a call on border line stands and differences in resolution. Practical limitations force people, who are following the manual approach, to "lump" streamside stands into 100 by 2,000-foot blocks, whereas the computer can "split" those stands into 30 by 30 meter patches.

**CWD Recruitment Potential Analysis Findings**

The streamside stands were evaluated with respect to their potential to supply large wood to the adjacent streams. Table ISCWD-2 summarizes these results.

Table ISCWD-2: Streamside CWD Recruitment Potential for BLM Land Based on Reclassed Landsat Data

| Risk classification for nonattainment of CWD into the stream from the streamside stands (image data captured summer 1993) | 2nd order and smaller streams | | 3rd order and larger streams | |
|---|---|---|---|---|
| | Reclassed acres within 100 feet of the stream centerline | calculated lineal feet of affected stream bank* | Reclassed acres within 100 feet of the stream centerline | calculated lineal feet of affected stream bank* |
| High risk | 1,367 | 595,335 | 187 | 81,623 |
| Medium risk | 3,398 | 1,480,042 | 1,092 | 475,719 |
| Low risk | 2,221 | 967,646 | 203 | 88,553 |
| Nonforest, recent clearcuts, and young hdwds & plantations | 929 | 404,459 | 242 | 105,546 |
| total | 7,914 | 3,447,482 | 1,725 | 751,440 |

** ((acres X 43,560 sq. ft/ac.) ÷ 100 ft width of the reclass zone). Stream bank length is used instead of stream length because the forest cover on one side of a stream can be substantially different from the other side in a managed landscape.*

Table ISCWD-3 shows the stream side forest types by acres and percent area at the watershed scale. Tables ISCWD-4 through ISCWD-7 displays the same data at the subwatershed scale.

**Synthesis and Interpretation**

Table ISCWD-8 gives the risk of non-attainment assigned to each stand type based on the DNR CWD recruitment potential assessment protocol. Table ISCWD-9 is a simple comparison of no action to potential treatments with respect to attainment of streamside trees suitable for CWD recruitment to streams. The "Density Management and Conversion Treatments and Attaining Riparian Reserve Function" section of the watershed analysis compares a range of active management options and treatment option in greater depth. That section also considers attaining an array of stream side forest functions whereas this section looks only at attainment of functional in stream CWD. Table ISCWD-9 summarizes treatment options, acres by stand type for the watershed and the relative distribution of stand types among the subwatersheds.

Table ISCWD-3: North Fork Coquille Watershed

| Location | Stand type | Size class and density within 100-feet of streams (excludes nonforest, young plantations and water) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | (stands < 10-inch average dbh) | | | (stands 10 to 19-inch ave. dbh) | | (stands 20-inch ave. dbh & larger) | | sub-totals | young plantations & NF | totals |
| | | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | All densities (5 to 95%) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | | | |
| ac. next to 2nd order & smaller streams | conifer | 913 | 891 | | 0 | 1,470 | 1,023 | 752 | 5,048 | | |
| | hardwood | | | 153 | 0 | 1,174 | 0 | 310 | 1,637 | | |
| | mixed | | | 301 | 0 | 0 | 0 | 0 | 301 | 929 | 7,914 |
| ac. next to 3rd order & larger streams | conifer | 141 | 100 | | 0 | 107 | 272 | 97 | 716 | | |
| | hardwood | | | 22 | 0 | 585 | 0 | 135 | 742 | | |
| | mixed | | | 24 | 0 | 0 | 0 | 0 | 24 | 242 | 1,725 |
| total acres next to all streams | conifer | 1,054 | 991 | | 0 | 1,577 | 1,295 | 848 | 5,764 | | |
| | hardwood | | | 175 | 0 | 1,759 | 0 | 445 | 2,380 | | |
| | mixed | | | 325 | 0 | 0 | 0 | 0 | 325 | 1,171 | 9,639 |
| % area by 2nd order & smaller streams | conifer | 9.5% | 9.2% | | 0.0% | 15.2% | 10.6% | 7.8% | 52.4% | | |
| | hardwood | | | 1.6% | 0.0% | 12.2% | 0.0% | 3.2% | 17.0% | | |
| | mixed | | | 3.1% | 0.0% | 0.0% | 0.0% | 0.0% | 3.1% | 9.6% | 82.1% |
| % area 3rd order % larger streams | conifer | 1.5% | 1.0% | | 0.0% | 1.1% | 2.8% | 1.0% | 7.4% | | |
| | hardwood | | | 0.2% | 0.0% | 6.1% | 0.0% | 1.4% | 7.7% | | |
| | mixed | | | 0.2% | 0.0% | 0.0% | 0.0% | 0.0% | 0.2% | 2.5% | 17.9% |
| total % area for all streams | conifer | 10.9% | 10.3% | | 0.0% | 16.4% | 13.4% | 8.8% | 59.8% | | |
| | hardwood | | | 1.8% | 0.0% | 18.2% | 0.0% | 4.6% | 24.7% | | |
| | mixed | | | 3.4% | 0.0% | 0.0% | 0.0% | 0.0% | 3.4% | | |
| | all | 10.9% | 10.3% | 5.2% | 0.0% | 34.6% | 13.4% | 13.4% | 87.9% | 12.1% | 100.0% |

Table ISCWD-4: North Coquille Subwatershed

| | | Size class and density within 100-feet of streams (excludes nonforest, young plantations and water) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | (stands < 10-inch average dbh) | | | (stands 10 to 19-inch ave. dbh) | | (stands 20-inch ave. dbh & larger) | | sub-totals | young plantations & NF | totals |
| | | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | All densities (5 to 95%) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | | | |
| ac. next to 2nd order & smaller streams | conifer | 128 | 228 | | 0 | 261 | 215 | 188 | 1,019 | | |
| | hardwood | | | 23 | 0 | 169 | 0 | 40 | 232 | | |
| | mixed | | | 74 | 0 | 0 | 0 | 0 | 74 | 126 | 1,451 |
| ac. next to 3rd order & larger streams | conifer | 19 | 37 | | 0 | 18 | 75 | 40 | 189 | | |
| | hardwood | | | 6 | 0 | 113 | 0 | 29 | 149 | | |
| | mixed | | | 8 | 0 | 0 | 0 | 0 | 8 | 25 | 371 |
| total acres next to all streams | conifer | 147 | 266 | | 0 | 278 | 290 | 228 | 1,208 | | |
| | hardwood | | | 29 | 0 | 283 | 0 | 69 | 381 | | |
| | mixed | | | 82 | 0 | 0 | 0 | 0 | 82 | 151 | 1,822 |
| % area by 2nd order & smaller streams | conifer | 7.0% | 12.5% | | 0.0% | 14.3% | 11.8% | 10.3% | 55.9% | | |
| | hardwood | | | 1.3% | 0.0% | 9.3% | 0.0% | 2.2% | 12.8% | | |
| | mixed | | | 4.1% | 0.0% | 0.0% | 0.0% | 0.0% | 4.1% | 6.9% | 79.7% |
| % area 3rd order % larger streams | conifer | 1.0% | 2.1% | | 0.0% | 1.0% | 4.1% | 2.2% | 10.4% | | |
| | hardwood | | | 0.3% | 0.0% | 6.2% | 0.0% | 1.6% | 8.2% | | |
| | mixed | | | 0.4% | 0.0% | 0.0% | 0.0% | 0.0% | 0.4% | 1.4% | 20.3% |
| total % area for all streams | conifer | 8.0% | 14.6% | | 0.0% | 15.3% | 15.9% | 12.5% | 66.3% | | |
| | hardwood | | | 1.6% | 0.0% | 15.5% | 0.0% | 3.8% | 20.9% | | |
| | mixed | | | 4.5% | 0.0% | 0.0% | 0.0% | 0.0% | 4.5% | | |
| | all | 8.0% | 14.6% | 6.1% | 0.0% | 30.8% | 15.9% | 16.3% | 91.7% | 8.3% | 100.0% |

Table ISCWD-5: Middle Creek Subwatershed

| Location | Stand type | Size class and density within 100-feet of streams (excludes nonforest, young plantations and water) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | (stands < 10-inch average dbh) | | | (stands 10 to 19-inch ave. dbh) | | (stands 20-inch ave. dbh & larger) | | sub-totals | young plantations & NF | totals |
| | | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | All densities (5 to 95%) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | | | |
| ac. next to 2nd order & smaller streams | conifer | 416 | 486 | | 0 | 588 | 598 | 454 | 2,541 | | |
| | hardwood | | | 96 | 0 | 676 | 0 | 170 | 942 | | |
| | mixed | | | 153 | 0 | 0 | 0 | 0 | 153 | 495 | 4,130 |
| ac. next to 3rd order & larger streams | conifer | 40 | 31 | | 0 | 27 | 148 | 48 | 294 | | |
| | hardwood | | | 12 | 0 | 329 | 0 | 73 | 413 | | |
| | mixed | | | 7 | 0 | 0 | 0 | 0 | 7 | 124 | 838 |
| total acres next to all streams | conifer | 456 | 517 | | 0 | 615 | 746 | 502 | 2,835 | | |
| | hardwood | | | 108 | 0 | 1,005 | 0 | 242 | 1,355 | | |
| | mixed | | | 159 | 0 | 0 | 0 | 0 | 159 | 619 | 4,968 |
| % area by 2nd order & smaller streams | conifer | 8.4% | 9.8% | | 0.0% | 11.8% | 12.0% | 9.1% | 51.1% | | |
| | hardwood | | | 1.9% | 0.0% | 13.6% | 0.0% | 3.4% | 19.0% | | |
| | mixed | | | 3.1% | 0.0% | 0.0% | 0.0% | 0.0% | 3.1% | 10.0% | 83.1% |
| % area 3rd order % larger streams | conifer | 0.8% | 0.6% | | 0.0% | 0.5% | 3.0% | 1.0% | 5.9% | | |
| | hardwood | | | 0.2% | 0.0% | 6.6% | 0.0% | 1.5% | 8.3% | | |
| | mixed | | | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 2.5% | 16.9% |
| total % area for all streams | conifer | 9.2% | 10.4% | | 0.0% | 12.4% | 15.0% | 10.1% | 57.1% | | |
| | hardwood | | | 2.2% | 0.0% | 20.2% | 0.0% | 4.9% | 27.3% | | |
| | mixed | | | 3.2% | 0.0% | 0.0% | 0.0% | 0.0% | 3.2% | | |
| | all | 9.2% | 10.4% | 5.4% | 0.0% | 32.6% | 15.0% | 15.0% | 87.5% | 12.5% | 100.0% |

Table ISCWD-6: Fairview Subwatershed

| Location | Stand type | Size class and density within 100-feet of streams (excludes nonforest, young plantations and water) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | (stands < 10-inch average dbh) | | | (stands 10 to 19-inch ave. dbh) | | (stands 20-inch ave. dbh & larger) | | sub-totals | young plantations & NF | totals |
| | | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | All densities (5 to 95%) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | | | |
| 2nd order and smaller streams | conifer | 277 | 97 | | 0 | 528 | 118 | 60 | 1,080 | | |
| | hardwood | | | 16 | 0 | 186 | 0 | 45 | 247 | | |
| | mixed | | | 50 | 0 | 0 | 0 | 0 | 50 | 97 | 1,475 |
| 3rd order and larger streams | conifer | 71 | 25 | | 0 | 60 | 35 | 6 | 197 | | |
| | hardwood | | | 3 | 0 | 99 | 0 | 27 | 129 | | |
| | mixed | | | 7 | 0 | 0 | 0 | 0 | 7 | 71 | 405 |
| total for all streams | conifer | 348 | 122 | | 0 | 588 | 154 | 66 | 1,278 | | |
| | hardwood | | | 19 | 0 | 285 | 0 | 72 | 376 | | |
| | mixed | | | 57 | 0 | 0 | 0 | 0 | 57 | 168 | 1,880 |
| % area by 2nd order & smaller streams | conifer | 14.7% | 5.2% | | 0.0% | 28.1% | 6.3% | 3.2% | 57.5% | | |
| | hardwood | | | 0.9% | 0.0% | 9.9% | 0.0% | 2.4% | 13.1% | | |
| | mixed | | | 2.7% | 0.0% | 0.0% | 0.0% | 0.0% | 2.7% | 5.2% | 78.5% |
| % area 3rd order % larger streams | conifer | 3.8% | 1.3% | | 0.0% | 3.2% | 1.9% | 0.3% | 10.5% | | |
| | hardwood | | | 0.2% | 0.0% | 5.3% | 0.0% | 1.4% | 6.9% | | |
| | mixed | | | 0.4% | 0.0% | 0.0% | 0.0% | 0.0% | 0.4% | 3.8% | 21.5% |
| total % area for all streams | conifer | 18.5% | 6.5% | | 0.0% | 31.3% | 8.2% | 3.5% | 68.0% | | |
| | hardwood | | | 1.0% | 0.0% | 15.2% | 0.0% | 3.8% | 20.0% | | |
| | mixed | | | 3.1% | 0.0% | 0.0% | 0.0% | 0.0% | 3.1% | | |
| | all | 18.5% | 6.5% | 4.1% | 0.0% | 46.4% | 8.2% | 7.3% | 91.0% | 9.0% | 100.0% |

Table ISCWD-7: North Coquille Mouth Subwatershed

| Location | Stand type | Size class and density within 100-feet of streams (excludes nonforest, young plantations and water) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | (stands < 10-inch average dbh) | | | (stands 10 to 19-inch ave. dbh) | | (stands 20-inch ave. dbh & larger) | | | | |
| | | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | All densities (5 to 95%) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | sub-totals | young plantations & NF | totals |
| 2nd order and smaller streams | conifer | 92 | 80 | | 0 | 94 | 92 | 50 | 408 | | |
| | hardwood | | | 18 | 0 | 142 | 0 | 56 | 216 | | |
| | mixed | | | 24 | 0 | 0 | 0 | 0 | 24 | 211 | 858 |
| 3rd order and larger streams | conifer | 11 | 6 | | 0 | 2 | 14 | 3 | 36 | | |
| | hardwood | | | 1 | 0 | 44 | 0 | 6 | 51 | | |
| | mixed | | | 2 | 0 | 0 | 0 | 0 | 2 | 35 | 125 |
| total for all streams | conifer | 103 | 86 | | 0 | 96 | 106 | 53 | 443 | | |
| | hardwood | | | 19 | 0 | 186 | 0 | 62 | 267 | | |
| | mixed | | | 26 | 0 | 0 | 0 | 0 | 26 | 246 | 983 |
| % area by 2nd order & smaller streams | conifer | 9.4% | 8.1% | | 0.0% | 9.6% | 9.4% | 5.0% | 41.5% | | |
| | hardwood | | | 1.8% | 0.0% | 14.5% | 0.0% | 5.7% | 21.9% | | |
| | mixed | | | 2.4% | 0.0% | 0.0% | 0.0% | 0.0% | 2.4% | 21.4% | 87.3% |
| % area 3rd order % larger streams | conifer | 1.1% | 0.6% | | 0.0% | 0.2% | 1.4% | 0.3% | 3.6% | | |
| | hardwood | | | 0.1% | 0.0% | 4.5% | 0.0% | 0.6% | 5.2% | | |
| | mixed | | | 0.2% | 0.0% | 0.0% | 0.0% | 0.0% | 0.2% | 3.6% | 12.7% |
| total % area for all streams | conifer | 10.5% | 8.7% | | 0.0% | 9.8% | 10.7% | 5.3% | 45.1% | | |
| | hardwood | | | 1.9% | 0.0% | 18.9% | 0.0% | 6.3% | 27.2% | | |
| | mixed | | | 2.7% | 0.0% | 0.0% | 0.0% | 0.0% | 2.7% | | |
| | all | 10.5% | 8.7% | 4.6% | 0.0% | 28.7% | 10.7% | 11.7% | 75.0% | 25.0% | 100.0% |

Table ISCWD-8: Risk of non-attainment of CWD and assessment

| | Size class and density within 100-feet of streams (excludes nonforest, young plantations and water) | | | | | |
|---|---|---|---|---|---|---|
| | (stands < 10-inch average dbh) | | (stands 10 to 19-inch ave. dbh) | | (stands 20-inch ave. dbh & larger) | |
| Stand type | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) |
| conifer | Current Risk: HIGH<br><br>Most these stands will move from "sparse" to "dense" as the trees grow and occupy the site.<br><br>Currently, random mortality and suppression mortality in dense patches may provide small woody material to the stream (Peet; Christensen 1987). This material is too small to provide lasting in stream structure and will rapidly decay and/or high flows will move this material down stream. | Current Risk: MEDIUM<br><br>Stands that were initially low stocked or PCTed will move rapidly from the "<10-inch dense" to "10 to 19-inch dense." High stocked stands that are not PCTed will move slowly into the "10 to 19-inch dense" class.<br><br>Currently, suppression mortality will provide small woody material to the stream (Peet; Christensen 1987). This material is too small to provide lasting in stream structure and will rapidly decay and/or high flows will move this material down stream. | Current Risk: MEDIUM<br><br>No "10 to 19-inch sparse" stands found within 100-feet of streams on BLM land in this watershed.<br><br>"10 to 19-inch sparse" stands, when they do occur are likely areas where heavy brush competition limited stocking or the result of a recent moderate severity disturbance. | Current Risk: LOW<br><br>Random mortality of dominant and larger codominant trees may provide durable in stream structure.<br><br>For a given site class and stand age, the number of larger trees that could provide long lasting in stream structure increases with decreased total stocking. Increased total stocking will increase suppression mortality and will increase the time required for stand to grow to an average 20-inch dbh.<br><br>Suppression mortality will provide small woody material to the stream. Much of this material is too small to provide lasting in stream structure and will rapidly decay. If there are no large key pieces to trap the small woody material, high flows will move the small material down stream.<br><br>Poorly differentiated high density stands, if not thinned, are at long term risk. As these stands become more crowed, the trees will lose crown depth, and diameter growth will slow down causing the trees to develop unfavorable height to diameter ratios predisposing the trees to blow down. Dominant trees in well differentiated stands will maintain good crown depths and diameter growth rates. | Current Risk: MEDIUM<br><br>Random mortality of dominant and codominant trees will provide durable in stream structure.<br><br>Some "20-inch+ sparse" stands are likely the result of a moderate severity disturbance or repeated light disturbance. If the disturbance opened growing space for understory tree establishment and growth, the stand will eventually grow into a "20-inch+ dense" condition.<br><br>For a given site class, stand age and species of the dominant and codominant trees, the average tree size in a "sparse" stand will generally be larger than in a "dense" stand. However compared to a "20-inch+ dense" stand, there are fewer trees that can contribute CWD to the stream over the life of the stand, or as the result of a stand replacement event.<br><br>A stand replacement event will provide a small to moderate pulse of CWD, which if retained, will provide in stream structure until the replacement stand is old enough to supply 20-inch diameter and larger pieces to the stream. | Current Risk: LOW<br><br>Random mortality of dominant and codominant trees will provide durable in stream structure.<br><br>A stand replacement event will provide a large pulse of CWD, which if retained, will provide in stream structure until the replacement stand is old enough to supply 20-inch diameter and larger pieces to the stream. |

Table ISCWD-8: Risk of non-attainment of CWD and assessment

| | Size class and density within 100-feet of streams (excludes nonforest, young plantations and water) | | | | | |
|---|---|---|---|---|---|---|
| | (stands < 10-inch average dbh) | | (stands 10 to 19-inch ave. dbh) | | (stands 20-inch ave. dbh & larger) | |
| Stand type | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) |
| hardwood | Current Risk: HIGH<br><br>Most these stands will move from "sparse" to "dense" as the trees grow and occupy the site.<br><br>Currently, random mortality and suppression mortality in dense patches may provide small woody material to the stream. This material is too small to provide in stream structure and will rapidly decay and/or high flows will move material down stream. | Current Risk: HIGH<br><br>Stands that were initially low stocked will move rapidly from the "<10-inch dense" to "10 to 19-inch dense." High stocked stands will move slowly into the "10 to 19-inch dense" class.<br><br>Currently, suppression mortality will provide small woody material to the stream. This material is too small to provide lasting in stream structure and will rapidly decay and/or high flows will move material down stream. | Current Risk: HIGH<br><br>No "10 to 19-inch sparse" stands found within 100-feet of streams on BLM land in this watershed.<br><br>"10 to 19-inch sparse" stands, when they do occur are likely areas where heavy brush competition limited stocking or the result of a recent moderate severity disturbance. | Current Risk: MEDIUM<br><br>Random mortality of dominant and larger codominant trees may provide in stream structure. However, the hardwood CWD is not durable and will decay rapidly.<br><br>Tipped over Oregon myrtle and big-leaf-maple that are still rooted in the stream bank can provide long lasting live in stream structure.<br><br>For a given site class and stand age, the number of larger trees that could provide in stream structure increases with decreased total stocking. Increased total stocking will increase suppression mortality and will increase the time required for stand to average 20-inch dbh.<br><br>Suppression mortality will provide small woody material to the stream. Much of this material is too small to provide lasting in stream structure and will rapidly decay. If there are no large key pieces to trap the small woody material, high flows will move the small material down stream.<br><br>Poorly differentiated high density stands are at long term risk. As these stands become more crowed, the trees will lose crown depth, and diameter growth will slow down causing the trees to develop unfavorable height to diameter ratios predisposing the trees to blow down. Dominant trees in well differentiated stands will maintain good crown depths and diameter growth rates. | Current Risk: HIGH<br><br>No "20-inch+ sparse" stands found within 100-feet of streams on BLM land in this watershed.<br><br>"20-inch+ sparse" stands, when they do occur, are likely the result of a moderate severity disturbance or repeated light disturbance. If the disturbance opened growing space for understory tree establishment and growth, the stand will eventually grow into an "20-inch+ dense" condition. | Current Risk: MEDIUM<br><br>Random mortality of dominant and codominant trees will provide large but non-durable in stream structure.<br><br>Tipped over Oregon myrtle and big-leaf-maple that are still rooted in the stream bank can provide long lasting live in stream structure. |

Table ISCWD-8: Risk of non-attainment of CWD and assessment

| | Size class and density within 100-feet of streams (excludes nonforest, young plantations and water) | | | | | |
|---|---|---|---|---|---|---|
| | (stands < 10-inch average dbh) | | (stands 10 to 19-inch ave. dbh) | | (stands 20-inch ave. dbh & larger) | |
| Stand type | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) |
| mixed | Current Risk: HIGH<br><br>Most these stands will move from "sparse" to "dense" as the trees grow and occupy the site.<br><br>Random mortality and suppression mortality in dense patches may provide small woody material to the stream. This material is too small to provide in stream structure and will rapidly decay and/or high flows will move material down stream. | Current Risk: HIGH<br><br>Stands that were initially low stocked will move rapidly from the "<10-inch dense" to "10 to 19-inch dense." High stocked stands will move slowly into the "10 to 19-inch dense" class. Stands with established free to grow conifer will either remain in the "mixed" stand class or may shift to "conifer" stand class with time. Stands with few or no free to grow conifers will shift to the "hardwood" class barring a disturbance that releases the conifer.<br><br>Suppression mortality will provide small woody material to the stream. This material is too small to provide lasting in stream structure and will rapidly decay and/or high flows will move material down stream. | Current Risk: HIGH<br><br>No "10 to 19-inch sparse" stands found within 100-feet of streams on BLM land in this watershed.<br><br>"10 to 19-inch sparse" stands, when they do occur are likely areas where heavy brush competition limited stocking or the result of a recent moderate severity disturbance. | Current Risk: LOW<br><br>No "mixed 10 to 19-inch dense" stands found within 100-feet of streams on BLM land in this watershed.<br><br>Differences in growth rates between conifers and myrtles & maples result in a shift from mixed single-story stands to two-story stands where conifers dominate the overstory. Also the data used for this analysis is based on a 30X30-meter pixel. The individual patches of hardwoods and conifers are generally greater than 30X30-meters. This is reflected in the imagery data as scattered pixels for one forest type in a matrix dominated by the other type. | Current Risk: MEDIUM<br><br>No "mixed 20-inch+ sparse dense" stands found within 100-feet of streams on BLM land in this watershed.<br><br>Differences in growth rates between conifers and myrtles & maples result in a shift from mixed single-story stands to two-story stands where conifers dominate the overstory, and hardwoods occupy the understory. Also the data used for this analysis is based on a 30X30-meter pixel. The individual patches of hardwoods and conifers are generally greater than 30X30-meters. This is reflected in the imagery data as scattered pixels for one forest type in a matrix dominated by the other type. | Current Risk: LOW<br><br>No "mixed 20-inch+ dense" stands found within 100-feet of streams on BLM land in this watershed.<br><br>Differences in growth rates between conifers and myrtles & maples result in a shift from mixed single-story stands to two-story stands where conifers dominate the overstory, and hardwoods occupy the understory. Also the data used for this analysis is based on a 30X30-meter pixel. The individual patches of hardwoods and conifers are generally greater than 30X30-meters. This is reflected in the imagery data as scattered pixels for one forest type in a matrix dominated by the other type. |

Table ISCWD-9: Treatments that may reduce the risk of non-attainment of CWD. At the stand level, site conditions will determine treatment needs. This is not an all inclusive list.

| | Size class and density within 100-feet of streams (excludes nonforest, young plantations and water) | | | | | |
|---|---|---|---|---|---|---|
| | (stands < 10-inch average dbh) | | (stands 10 to 19-inch ave. dbh) | | (stands 20-inch ave. dbh & larger) | |
| Stand type | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) |
| conifer | Current Risk: HIGH<br><br>No action: If stand is not established with a fast growing shrub and/or red alder component - stand may be at risk of becoming a mixed or hardwood stand.<br><br>If stand is established - stand will likely transition from sparse to dense conifer with time.<br><br>Treatments: If stand is very young and not established - vegetation competition control, animal damage control, and interplanting may be needed to insure establishment. | Current Risk: MEDIUM<br><br>No action: Stand will continue to grow but attainment of large average stand diameter will be slower than a thinned stand.<br><br>Treatments: PCT will improve windfirmness and increase diameter growth compared to untreated stands. | Current Risk: MEDIUM<br><br>No " sparse" stands found within 100-feet of streams on BLM land in this watershed. | Current Risk: LOW<br><br>No action: Stand will continue to grow but attainment of large average stand diameter will be slower than a thinned stand.<br><br>Poorly differentiated stands (typically well-stocked uniform plantations and "dog-hair" natural stands) are at increasing risk of blow down.<br><br>Treatments: Thinning will improve diameter growth. This will speed attainment of large average stand diameters and maintain crown depths. Thinning poorly undifferentiated stands reduce the risk of blowdown. | Current Risk: MEDIUM<br><br>No action: Stand will provide large CWD but in amounts less than dense stands. However, stands with little or no understory trees and with a well established shrub layer may need a low to moderate severity disturbance before understory tree recruitment occurs.<br><br>Treatments: Large trees are on the site, but low to moderate stocking levels limit options for falling/ line-pulling trees into the channel. "Sparse" stands that lack an understory tree component, may benefit from treatments to recruit understory conifers that can eventually add to the CWD recruitment potential of the stand. However, alder conversion and thinning in younger stands would provide a more rapid restoration of premanagement stream side conditions. | Current Risk: LOW<br><br>No action: Stand will provide large CWD. However, stands with little or no understory trees and with a well established shrub layer may need a low to moderate severity disturbance before understory tree recruitment occurs.<br><br>Treatments: Falling/ line-pulling trees into the channel may benefit some streams but this option may be limited by lack of access. |

Table ISCWD-9: Treatments that may reduce the risk of non-attainment of CWD. At the stand level, site conditions will determine treatment needs. This is not an all inclusive list.

| | Size class and density within 100-feet of streams (excludes nonforest, young plantations and water) | | | | | |
|---|---|---|---|---|---|---|
| | (stands < 10-inch average dbh) | | (stands 10 to 19-inch ave. dbh) | | (stands 20-inch ave. dbh & larger) | |
| Stand type | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) |
| hardwood | Current Risk: HIGH | Current Risk: HIGH | Current Risk: HIGH | Current Risk: MEDIUM | Current Risk: | Current Risk: MEDIUM |
| | No action: Stand will continue to grow. If the hardwood stand is on a conifer site, then attainment of large durable in stream wood will be delayed until some time after the next stand replacement event.<br><br>Stands where myrtles and big-leaf-maples were cut during past harvest entries will have multi-steam stump sprout myrtles and big-leaf-maple. The stump sprout clumps have numerous small diameter stems and will be highly competitive for growing space.<br><br>Treatments: Thinning would accelerate tree growth. However, hardwoods do not provide durable CWD.<br><br>If stand is on a conifer site (as indicated by the presence of conifer prior to past timber harvest or other disturbance) conversion to conifer would speed attainment of large durable CWD.<br><br>Restoring single stem form to stump sprouting hardwoods will concentrate diameter growth on fewer stems resulting in larger diameter hardwoods. On mixed stand sites this could provide growing space for conifers allowing restoration of the mixed stand condition. | | No " 10 to 19-inch sparse" stands found within 100-feet of streams on BLM land in this watershed. | No action: Stand will continue to grow. If the hardwood stand is on a conifer site, then attainment of large durable in stream wood will be delayed until after the next stand replacement event.<br><br>Treatments: Thinning would accelerate tree growth. However, hardwoods do not provide durable CWD.<br><br>If the stand is on a conifer site, conversion to conifer would speed attainment of large durable CWD. | No " 20-inch+ sparse" stands found within 100-feet of streams on BLM land in this watershed. | No action: Most 20-inch+ hardwood stands on BLM in this watershed are myrtle and big-leaf-maple stands on hardwood sites. These stands are not in danger of breaking up.<br><br>Alder stands averaging > 20-inches dbh are likely senescent. The breakup of these stands can result in a salmonberry brushfield. This stand type currently is not common on BLM land in this watershed.<br><br>Treatments: While myrtle and big-leaf-maple stands are not optimal for producing large durable CWD for streams, they do provide other benefits to the stream and provide habitat for species that benefit from mixed stand and old large hardwood habitats. Some older hardwood stands, which had a conifer component in the past, may benefit from treatments to recruit understory conifers that can eventually add to the CWD recruitment potential of the stand. However, alder conversions and thinning in younger stands elsewhere in the watershed would provide a more rapid restoration of pre-management stream side conditions. |

Table ISCWD-9: Treatments that may reduce the risk of non-attainment of CWD. At the stand level, site conditions will determine treatment needs. This is not an all inclusive list.

| | Size class and density within 100-feet of streams (excludes nonforest, young plantations and water) | | | | | |
|---|---|---|---|---|---|---|
| | (stands < 10-inch average dbh) | | (stands 10 to 19-inch ave. dbh) | | (stands 20-inch ave. dbh & larger) | |
| Stand type | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) |
| mixed | Current Risk: HIGH | Current Risk: HIGH | Current Risk: HIGH | Current Risk: LOW | Current Risk: MEDIUM | Current Risk: LOW |
| | No action: Stand will continue to grow but attainment of large average stand diameter will be slower than a thinned stand.<br><br>Stands where alder are well established and growing faster than the conifer may transition into " dense hardwood" stands that produce little if any durable CWD.<br><br>Stands where hardwoods established after the conifer and are unlikely to over top the conifer will likely develop into "mixed dense" stands.<br><br>Stands where myrtles and big-leaf-maples were cut during past harvest entries will have multi-steam stump sprout myrtles and big-leaf-maple. The stump sprout clumps have numerous small diameter stems and will be highly competitive for growing space.<br><br>Treatments: Vegetation control and/or PCT-release treatments will improve probability that conifers will remain a component of the mixed conifer/ myrtle-maple stands and provide growing space favorable for conifer diameter growth.<br><br>On conifer sites, vegetation control and/or PCT-release treatments will improve probability that mixed conifer/ alder stands develop into conifer stands and improve conifer growth rates.<br><br>Restoring single stem form to stump sprouting hardwoods will concentrate diameter growth on fewer stems resulting in larger diameter hardwoods, and more growing space for conifers. | | No " sparse" stands found within 100-feet of streams on BLM land in this watershed. | No "mixed dense" stands found within 100-feet of streams on BLM land in this watershed. | No "mixed 20-inch+ sparse" stands found within 100-feet of streams on BLM land in this watershed. | No "mixed 20-inch+ dense" stands found within 100-feet of streams on BLM land in this watershed. |

Table ISCWD-10: Summary of treatments that may reduce the risk of non-attainment of CWD. At the stand level, site conditions will determine treatment needs. This is not an all inclusive list.

| Stand type & Location | Young plantations | size class and density within 100-feet of streams (excludes nonforest, young plantations) | | | | | |
|---|---|---|---|---|---|---|---|
| | | (stands < 10-inch average dbh) | | (stands 10 to 19-inch ave. dbh) | | (stands 20-inch ave. dbh & larger) | |
| | | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) | Sparse (5 to 65% crown closure) | Dense (75 to 95% crown closure) |
| conifer | treatments to establish the stand<br><br>PCT to promote growth and improve windfirmness | treatments to establish the stand<br><br>thinning in stands on the denser end of the canopy closure range to promote diameter growth and improve windfirmness | thinning to promote diameter growth and improve wind-firmness on the stand scale | No "sparse conifer" stands found within 100-feet of streams on BLM land in this watershed. | thinning to promote diameter growth and improve windfirmness on the stand scale<br><br>treatments to recruit understory trees or provide growing space of existing understory trees | mature & old-growth: no treatment needed to obtain large trees<br><br>late seral with large trees: treatments to recruit understory trees or provide growing space for existing understory trees | mature & old-growth: no treatment needed to obtain large trees<br><br>late seral with large trees: treatments to recruit understory trees or provide growing space of existing understory trees<br><br>line-pulling or falling to recruit large CWD to streams |
| acres within 100-ft of streams | (map color: yellow)<br>1,171 acres<br>acre distribution by subwatershed: MC>NCM>F>NC | (map color: light green)<br>1,054 acres<br>acre distribution by subwatershed: MC>F>NC>NCM | (map color: green)<br>991 acres<br>acre distribution by subwatershed: MC>NC>F>NCM | 0 | (map color: green)<br>1,577 acres<br>acre distribution by subwatershed: MC>F>NC>NCM | (map color: dark green)<br>1,295 acres<br>acre distribution by subwatershed: MC>NC>F>NCM | (map color: black)<br>848 acres<br>acre distribution by subwatershed: MC>NC>F>NCM |
| hardwood | N/A | convert alder stands on conifer sites back to conifer<br><br>thin alders on alder to promote diameter growth<br><br>restore single-stem tree form to multi-stemmed stump sprout myrtles & big-leaf-maples | | No "sparse hardwood" stands found within 100-feet of streams on BLM land in this watershed. | conversion of alder stands on conifer sites back to conifer<br><br>thin alders on alder sites to promote diameter growth<br><br>restore single-stem tree form to multi-stemmed stump sprout myrtles & big-leaf-maples<br><br>restore conifer component on mixed stand sites | No "sparse hardwood" stands found within 100-feet of streams on BLM land in this watershed. | treatments to recruit understory trees or provide growing space of existing understory trees or to reestablish a conifer presence on site suitable for mixed stands<br><br>no treatment |
| ac. within 100-ft of streams | N/A | (map color: salmon pink)<br>175 acres<br>acre distribution by subwatershed: MC>NC>F=NCM | | 0 | (map color: red)<br>1,759 acres<br>ac. distribution by subwatershed: NC>F=NC>NCM | 0 | (map color: dark purple)<br>445 acres<br>acre distribution by subwatershed: MC>F=NC=NCM |
| mixed | N/A | thinning and/or release to maintain a conifer presence on mixed stand sites and promote diameter growth<br><br>vegetation control to establish conifers on conifer sites and promote growth<br><br>restore single-stem tree form to multi-stemmed stump sprout myrtles & big-leaf-maples | | No "sparse mixed" stands found within 100-feet of streams on BLM land in this watershed. | No "dense mixed" stands found within 100-feet of streams on BLM land in this watershed. | No "sparse mixed" stands found within 100-feet of streams on BLM land in this watershed. | No "dense mixed" stands found within 100-feet of streams on BLM land in this watershed. |
| ac. within 100-ft of streams | N/A | (map color: dark blue)<br>325 acres<br>acre distribution by subwatershed: MC>NC>F>NCM | | 0 | 0 | 0 | 0 |
| all | other treatments may include but not limited to: concurrent treatments to obtain late-successional characteristics; no treatment/ light treatment areas to protect values and address site specific concerns; no treatment when stand is on trajectory to develop into old-growth | | | | | | |

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## Previous Work in the North Fork Coquille

### Introduction

The large wood debris (LWD) recruitment potential was evaluated during the initial watershed analyses completed in the North Fork Coquille Watershed. The following table describes circumstances of each evaluation:

| | Middle Creek Subwatershed | Fairview Subwatershed | North Coquille Subwatershed | North Coquille Mouth Subwatershed |
|---|---|---|---|---|
| analysis document | Middle Creek Watershed Analysis - 1995 | Fairview Watershed Analysis - 1995 | North Coquille Watershed Analysis - 1995 | Middle Main Coquille/ North Coquille Mouth/ Catching Creek Watershed Analysis - 1997 |
| aerial photo flight year | 1992 | 1992 | 1992 | 1992 for current condition, 1950 photos for determining pre-management condition and identify hardwood sites. |
| Lands evaluated | BLM and private | BLM and private | BLM and private | BLM only |
| method used | DNR method modified to consider stands 100 feet each side of streams | DNR method modified to consider stands 100 feet each side of streams | DNR method modified to consider stands 100 feet each side of streams | DNR method used as a guideline to identify problem reaches. Evaluation considered whether sites were conifer or hardwood sites. |
| Outputs | percent and miles of fish bearing stream by CWD recruitment potential class | percent and miles of fish bearing stream by CWD recruitment potential class | percent and miles of fish bearing stream by CWD recruitment potential class | Short description of conditions by section, and maps showing candidate areas for further evaluation and treatment |

The North Fork Coquille Watershed Analysis replaces earlier watershed documents done for subwatersheds inside watershed area. The following CWD assessments from the earlier watershed analyses were copied into this document with few changes so they would be available for future reference. In the time between the initial assessments and the current document, we stopped using BLM hydrologic unit naming convention in favor of adopting the U.S. Geologic Survey convention. Also we revised the subwatershed boundaries. This revision moved the Hudson Creek Drainage from the North Coquille Subwatershed and placed it in the Fairview Subwatershed. The change in naming convention is shown in the following table.

Nomenclature Differences Between Current and Early Watershed Analysis Documents:

| field | Current Hydrologic Unit Names | Old Unit Names Used in Early Watershed Documents |
|---|---|---|
| 4th field | Subbasin | ---- |
| 5th field | Watershed | Analytical Watershed |
| 6th field | Subwatershed | Subbasin |
| 7th field | Drainage | Compartment |

**Text, Figures and Maps from Previous CWD Assessments in the North Fork Coquille Watershed**

***North Coquille Subwatershed*** -The current recruitment potential of LWD material that could reach stream channels of fish bearing streams in the North Coquille Subbasin (46 miles of stream) was mapped and evaluated based on Washington Department of Natural Resources methods and looked at the timber stand composition of a 100 foot riparian zone along each side of these streams. (See Map LWD-1 showing the fish bearing streams analyzed.) Only 18.9% of the stream sides were classified as having good recruitment potential on all lands and is 34.4% for streams sides through lands administered by the BLM (Figures LWD-1 and LWD-2). The current recruitment potential of LWD for the Key Watershed is basically the same (35.5% good) as for all the lands administered by BLM (Figure LWD-3). This is due to the fact that most of the Key Watershed drainage is lands administered by the BLM and is in a Late Successional Reserve. Figures LWD-4 and LWD-5 shows the breakdown of the LWD recruitment potential types for all lands and within the Key Watershed.

Forested head walls and steep side slopes are an important sources that feed large woody debris to streams. When these areas fail, they supply trees, boulders, and cobbles which contribute to structure in the lower reaches. Analysis was done to determine how many miles of streams could contribute large woody debris from the hill slopes in the subbasin. The assumption was that headwalls and side slopes associated with 1st to 3rd order streams that are within Moderate to High Landslide Potential areas would be the probable sources for this material. There are approximately 220 miles of streams that meet the criteria that feed fish bearing or 4th order plus streams. Of this only 18 miles of streams (8.3%) that meet the criteria are within areas of late successional forest. Of the 18 miles of stream, 16 miles (90%) is within the Key Watershed.

Roads crossing streams can be barriers that prevent the large wood, boulders and gravels from reaching the major streams. The analysis showed that of the 18 miles of streams that could supply material down slope, 3.5 miles (19%) were above road crossings. Map No. LWD-2 shows the locations of the road crossings.

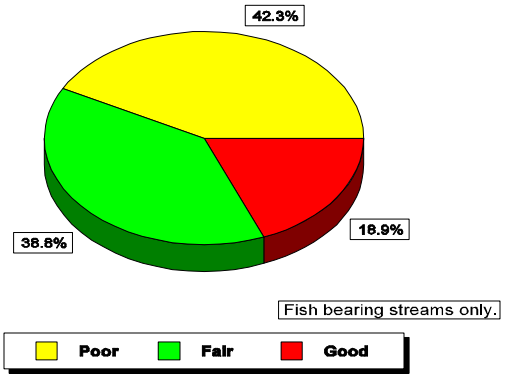



Figure LWD-1

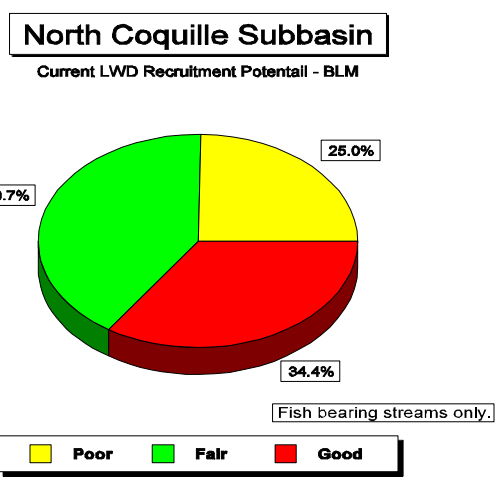



Figure LWD-2

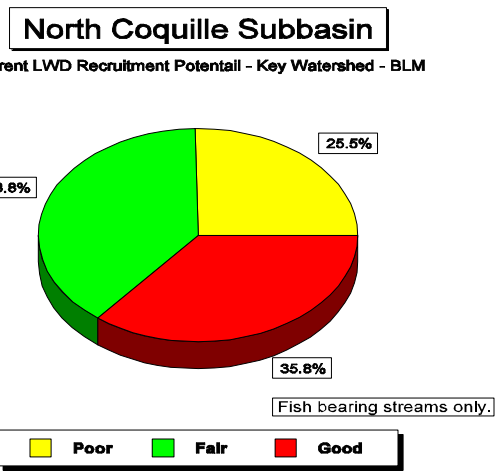



Figure LWD-3

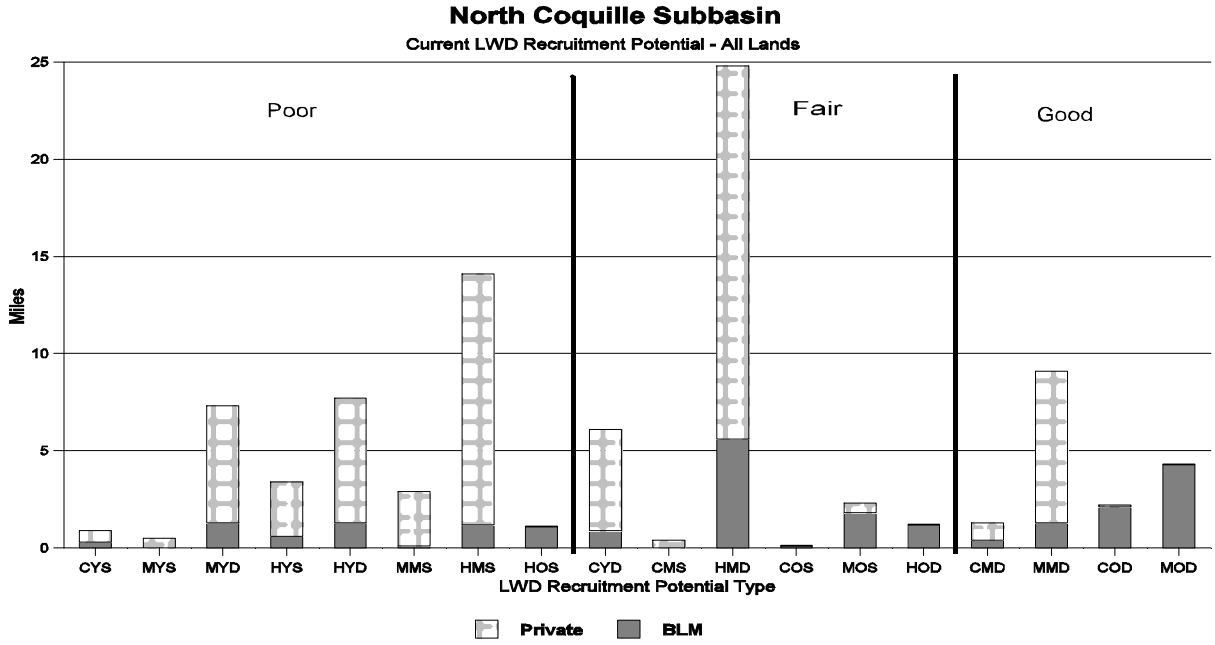



Figure LWD-4

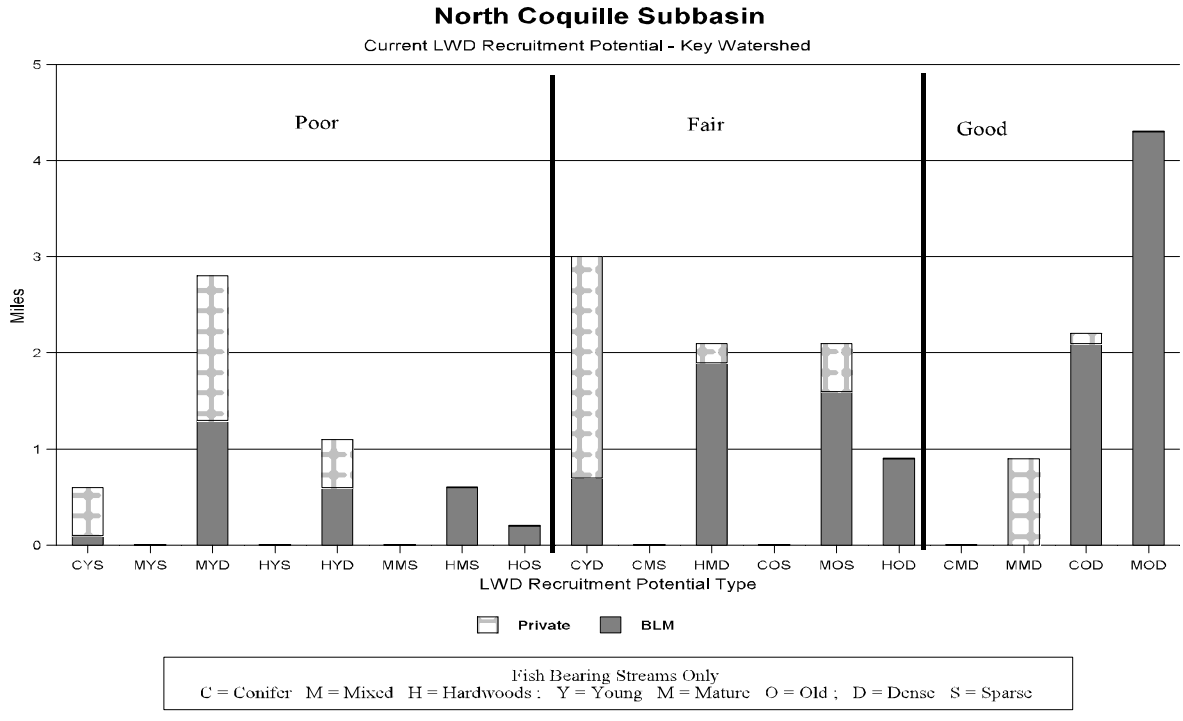
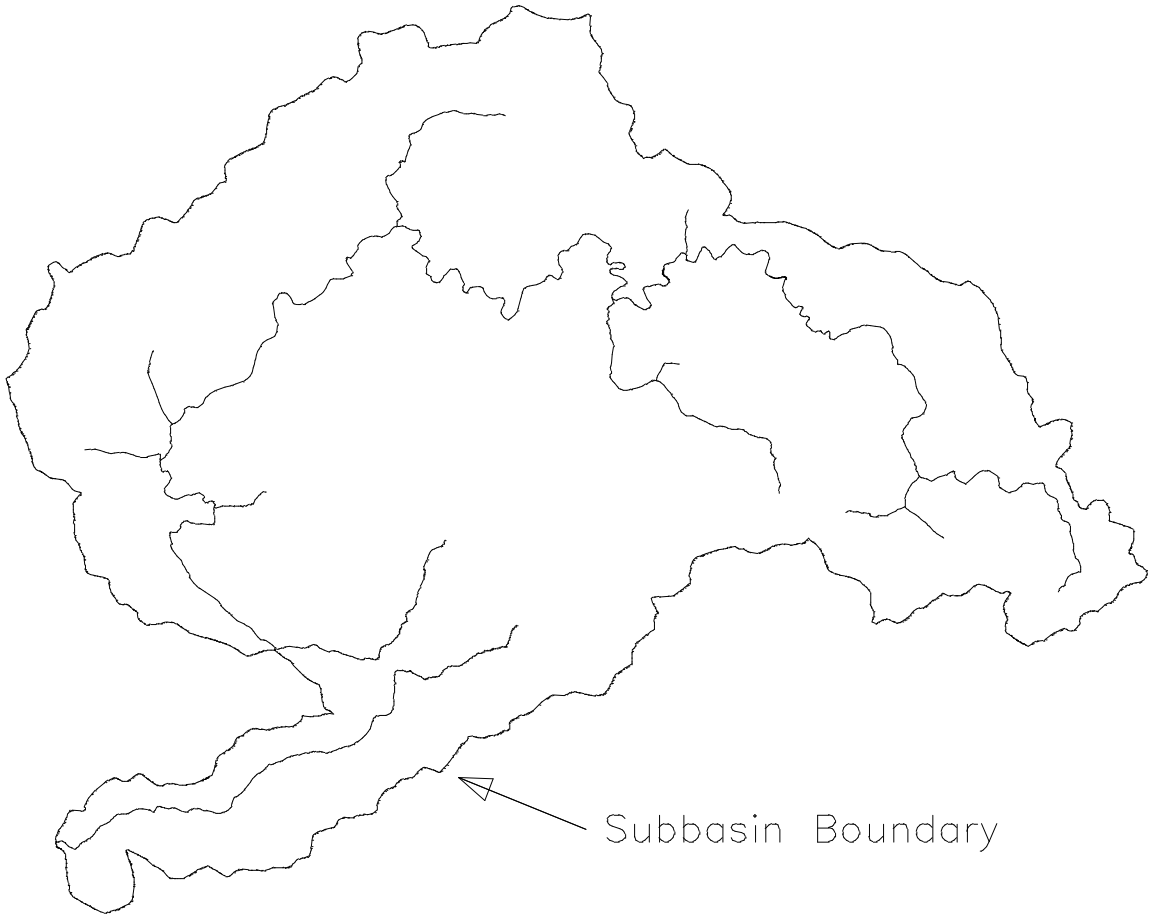
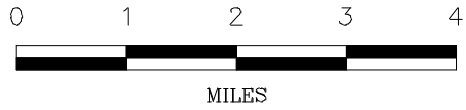



Figure LWD-5



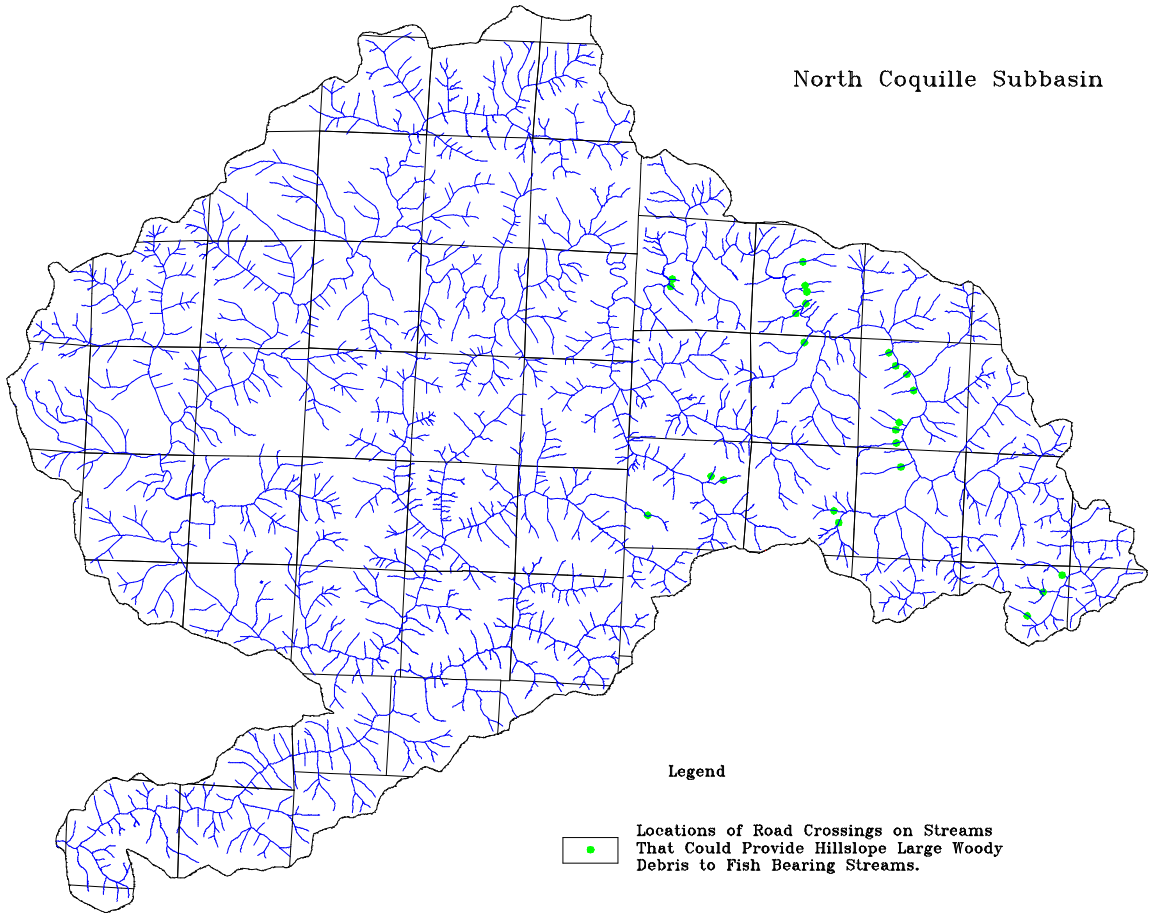


*FISH–BEARING STREAMS*

*IN*

*NORTH COQUILLE SUBBASIN*

Map LWD-1




Map LWD-2

Roads crossing streams that have a "good" designation for LWD recruitment, which could supply LWD from hillslopes and headwall to fish bearing 4th order and larger streams:

| | | | Number of Stream Crossings |
|---|---|---|---|
| BLM Controlled Roads | | | |
| Paved: | 25-10-30.0 | N. F. Coquille Rd | 4 |
| | 25-10-30.0 | N. F. Coquille Rd | 8 |
| Gravel: | 26-10-17.4 | | 2 |
| | 26-10-19.1 | | 2 |
| | 26-10-19.2 | | 1 |
| | 26-10-27.0 | | 3 |
| BLM/Private Shared Control Roads | | | |
| Gravel: | 26-10-16.0 | (ext of N. F. Coquille Rd) | 2 |
| Private Controlled Roads | | | |
| Natural surface: | 26-10-7.0 | | 2 |

***Fairview Subwatershed*** - The current recruitment potential of LWD material that could reach stream channels of fish bearing streams in the Fairview Subbasin (40 miles of stream) was mapped and evaluated. The analysis was based on Washington DNR methods and looked at the timber stand composition of a 100 foot riparian zone along each side of these streams. Map LWD-3 shows the fish bearing streams analyzed. Only 16.6% of the stream sides were classified as having good recruitment potential on all lands and is 27.7% for streams sides through lands administered by the BLM (Figures LWD-6 and LWD-7). Figure LWD-8 shows the breakdown of the LWD recruitment potential types for all lands in the subbasin on fish bearing streams.

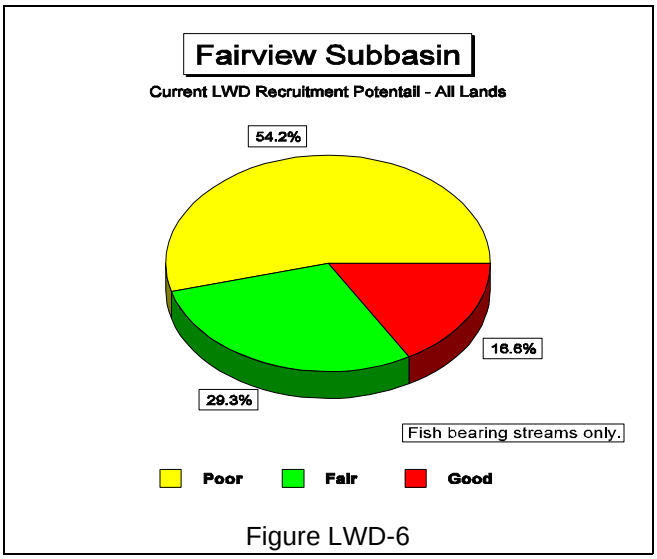


Figure LWD-6

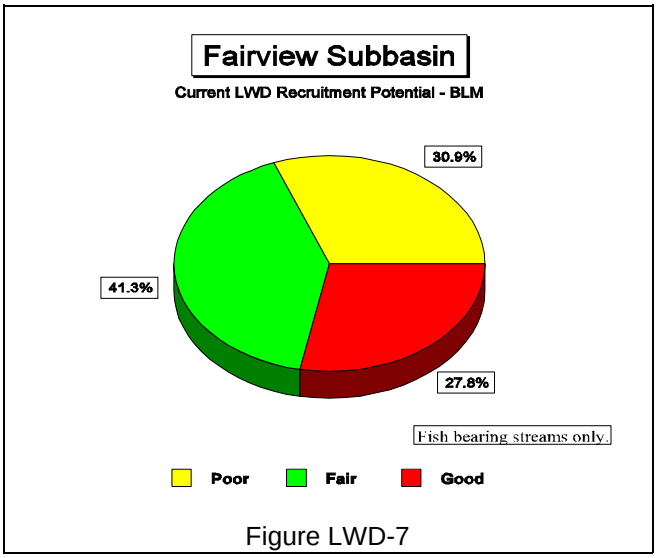


Figure LWD-7

Riparian vegetation inventories - Based on the results of the large woody debris recruitment potential analysis, three streams on BLM land were visited. These streams are Woodward Creek, Steinnon Creek and Swayne Creek. The site visits revealed that most of the hardwoods on the BLM reaches of Steinnon and Swayne Creeks were largely confined to active flood plains. The alder patches on the lower slopes and benches inside the riparian zone were too small to be operational. There are opportunities to reestablish conifer in parts of the BLM reaches of the Woodward Creek riparian zone. The riparian vegetation surveyors commented that based on the locations of conifer stumps, there had been a mixed conifer-myrtle stand before the drainage was logged. Reestablishing a mixed conifer-hardwood stand along Woodward Creek may require killing the smaller stems of multi stemmed myrtles and leaving one or more of the larger stems so to have sufficient light for conifer establishment. If we attempt to create gaps in the myrtles and regenerate conifer, that work should be considered experimental and monitoring beyond reforestation surveys may be needed. During follow up visits, small patches of alders were found on sites suitable for reintroducing conifers. Additional considerations and cautions are discussed in the riparian survey summary.

Swayne and Steinnon Creeks are extremely different from each other, and show the effect of geology on sediment and gravel. Swayne Creek, which flows through Roseburg Formation sandstone and siltstone, is gravel poor. Sand, silt and clay comprise most of the substrates. The upper portion of the surveyed segment of Steinnon Creek flows through marine basalt. That portion of the stream is gravel rich. That gravel is a mix of both basalt and sandstone gravel.

The abundance of western redcedar observed in section 3, in the Steinnon Creek Compartment is noteworthy. The redcedars are more numerous but smaller than the Douglas-fir. Based on a very small sample of increment cores, the redcedars regenerated about the same time as most of the Douglas-fir.

The riparian surveyors found a 12-foot high fill and a partially collapsed culvert where an abandoned rail road grade crosses Swayne Creek.

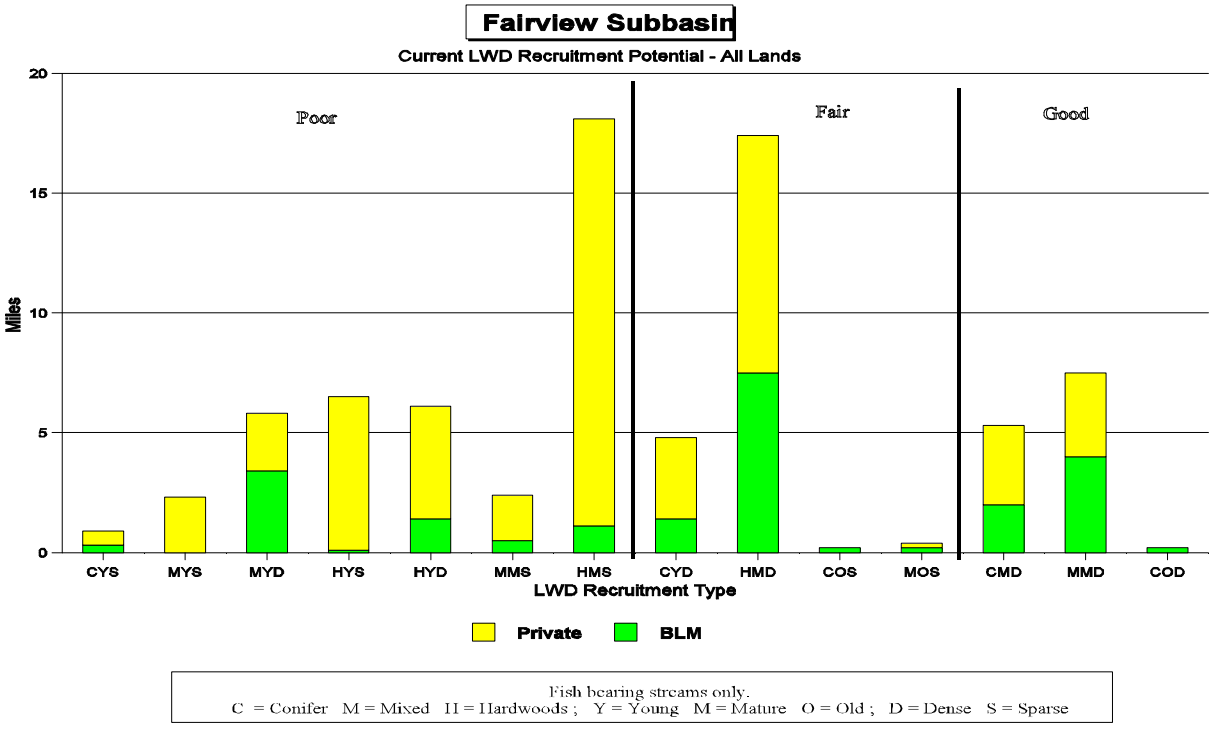
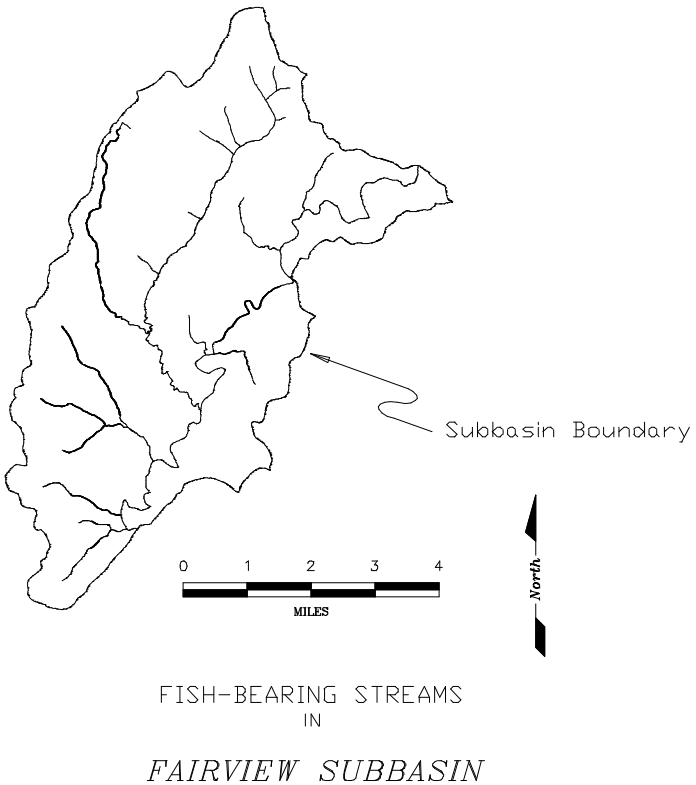



**Figure LWD-8**




Map LWD-3

Reference Riparian Stands - The North Fork Coquille River reaches with the most intact riparian zones are found in Laverne County Park section 5, T.27S., R.11W., BLM administered land in section 13, T.27S., R.11W., and Rock Prairie County Park, section 35, T.27S., R.12W., Will. Mer. Lost Creek, where it passes through the wooded part of Rock Prairie County Park, is a particular interesting because it shows how small creeks may have looked where they cross the flood plain of a larger stream. Although these four reaches have utility as reference stands, they too have been modified.

***Middle Creek Subwatershed*** - The future recruitment potential of large woody debris material that could reach stream channels of fish bearing streams in the Middle Creek subbasin was mapped and evaluated based on Washington DNR methods and looked at the timber stand composition of a 100 foot riparian zone along these streams. These streams are mostly Rosgen type B and C, with a few type A cutthroat trout only streams from above Tyee Formation waterfalls. Streams on private land are second-growth forests or agricultural lands, while BLM stream sections are composed primarily of second-growth forests and mature buffers with some residual mature forest stands such as the Cherry Creek Research Natural Area. A small percentage (1 percent and 6 percent) of the area was considered "naturally poor" for having unsuitable rock, and "non-recruitment" for having agriculture, and both were unsuitable to grow large trees.

In the absence of the delivery of new debris to the channels of second-growth forested streams from hillslope processes such as massive blow down or debris avalanche, the second-growth riparian zone becomes the only significant LWD source. In young forest stands, the input of new conifer debris large enough to be stable in third order or greater channels remains low through the first forty to sixty years and does not begin to increase until approximately sixty years after harvest (Bisson et al. 1987). Given this, the analysis was carried out sixty years to accommodate young and newly planted stands.

Only 18 percent of the current recruitment potential (75 percent of this on BLM land) is in good condition. This reflects the scarce mature and old conifer/mixed stands in the watershed. Expanding this to sixty years and the future recruitment potential in good condition shifts to 65 percent (35 percent of this on BLM land). This shift reflects more favorable State of Oregon Forest Practice Water Protection Rules that went into effect in 1994 and requires greater streamside habitat protection. For this exercise, it was assumed that the instream habitat improvement options for private lands would not be used and that minimum basal area requirements would be met. The analysis for Cherry Creek, the key watershed is almost as dramatic, with a 25 percent current recruitment potential (99 percent of this on BLM land) in good condition expanded out to sixty years shifts to 62 percent good condition (56 percent of this on BLM land).

Approximately 43 percent of the current recruitment potential (40 percent of this on BLM land) is in fair condition. Expanding this to sixty years and the future recruitment potential in fair condition shifts to only 21 percent (approximately 100 percent of this on BLM land). The analysis for Cherry Creek shows 30 percent current recruitment potential (32 percent of this on BLM land) in fair condition expanded out to sixty years shifts to 21 percent (97 percent of this on BLM land).

Thirty-two percent of the current recruitment potential (50 percent of this on BLM land) is in poor condition. This reflects a dominance of young hardwoods and sparse, mixed or sparse conifer stands that are currently present in the subbasin. Expanding this to sixty years and the future recruitment potential in poor condition shifts to only 7 percent (approximately 60 percent of this on BLM land). The analysis for Cherry Creek shows 36 percent current recruitment potential (71 percent of this on BLM land) in poor condition expanded out to sixty years shifts to 8 percent (63 percent of this on BLM land).

With poor and fair LWD recruitment potential encompassing 35 percent of BLM timber stands in riparian habitat on fish bearing streams, it would seem that there is a need to initiate large scale riparian silvicultural practices to improve this classification to a good category. By projecting this habitat to sixty years with no management, this poor and fair percentage drops to 25 percent on BLM land. This would indicate that there is a possible need to enter a portion of the 154 acres of red alder for partial conversion to conifer and 14 acres of mixed stand for conifer release. These actions could reduce this 25 percent over 60 years by an unknown amount, but riparian silviculture should be considered only as a secondary method of recruitment in these areas and only on the most suitable ground.

This analysis was done only for the known fish bearing streams and their immediate streamsides. It is recognized that upstream processes will flush wood to these streams, but this process has been slowed by the recent long term drought the Pacific Northwest has been experiencing. While the contribution of LWD to the channel from the streamside is important and provides immediate structure, the input from the hillslope processes should not be ignored and should be considered as the major contributor to these streams.

***North Coquille Mouth*** -
The follow is an assessment of streams on BLM land in the North Coquille Mouth Subwatershed based on examining the 1950 and the 1992 aerial photos.

27-11-35 North Fork Coquille River. Looks pretty much the same. Low risk.

28-12-01 No Name. There is a portion of this creek that has a high risk. In the 1950's this area was already deforested probably by fire, harvesting, grazing. No photo coverage any earlier than this. Ground truth.

28-12-13 Wimer Creek Tributary. This area has been harvested after 1950. The riparian areas were mixed in the 1950 and are mostly hardwood today, but left alone the conifer component will increase. Medium risk.

28-11-19 Wimer Creek. All conifer (older) in 1950. Two areas identified as being high risk. (See map).

28-12-23 North Fork Coquille Tributary. Low risk.

28-12-27 Gray Creek. Low risk.

28-12-25 North Fork Coquille River. This section rates out as having a high risk, but this is a fairly flat floodplain that has historically had hardwoods on it.

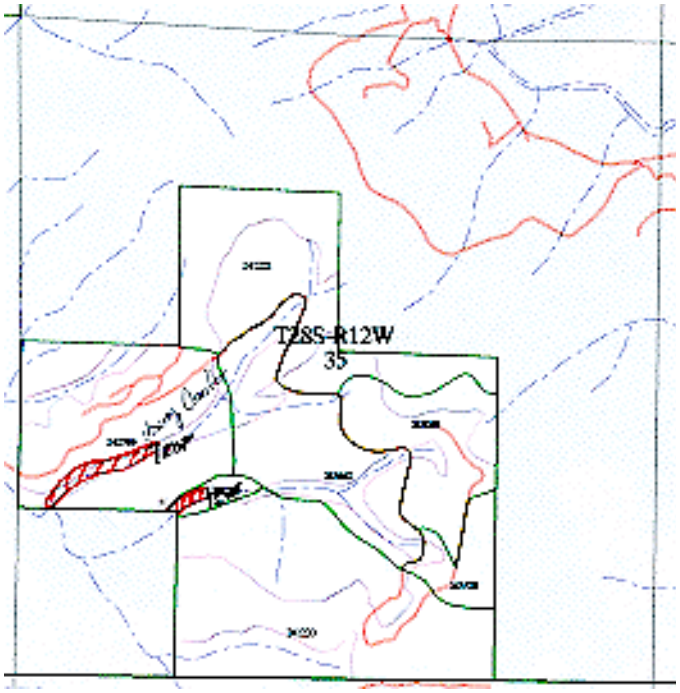
28-12-25 Llewellyn Tributary. Historically conifer. Two areas identified as being high risk. One area is young conifer. The other area is a possible conversion or release. Ground truth (see map).

29-12-01 John's Creek. Medium risk.

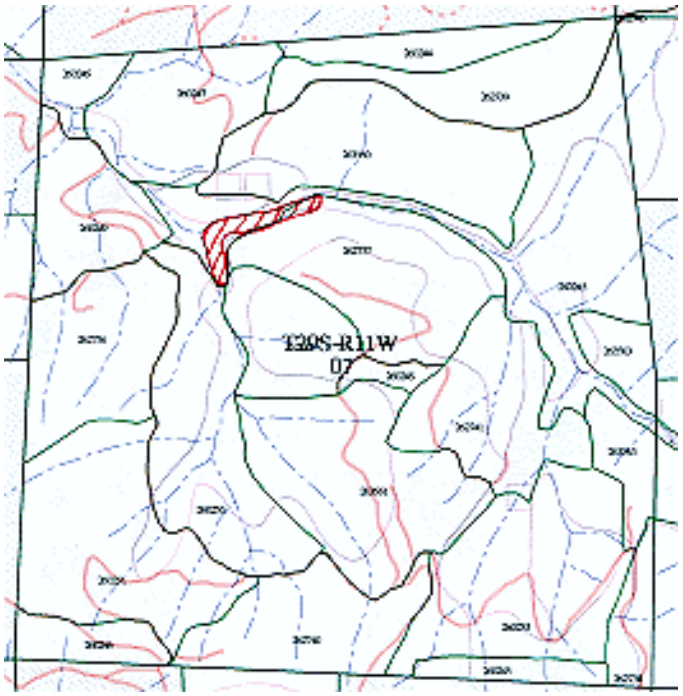
29-11-07 John's Creek. In 1950 most of the area hadn't been disturbed. One potential area for release or conversion (see map).

29-11-08 John's Creek. Low risk.

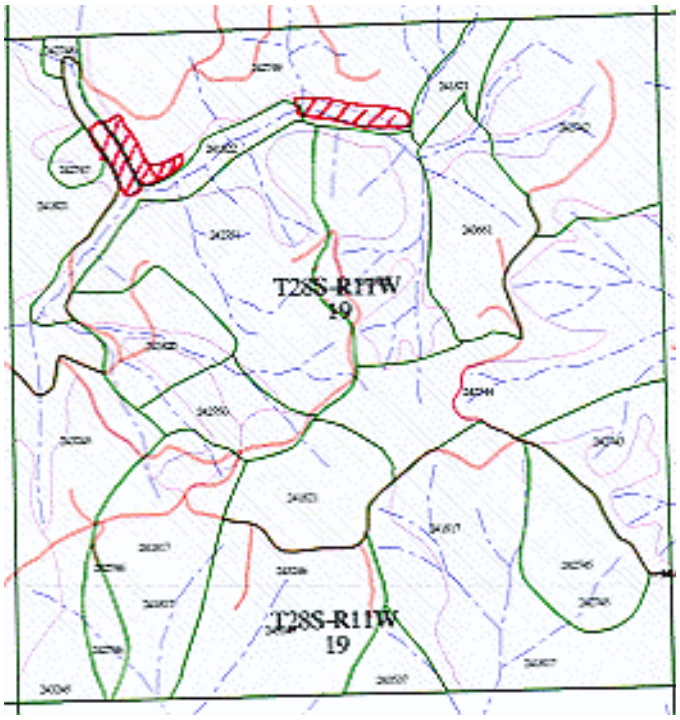
The following three maps show areas identified for treatment to improve future potential to recruit large wood to streams in the North Fork Coquille Mouth Subwatershed. These sites were identified as part of preparing the Middle Main Coquille/ North Coquille Mouth/ Catching Creek Watershed Analysis (USDI 1997).




28-12-25, Llewellyn Tributary. Two areas identified as "high risk" for non-attainment of large wood to the stream. The 1950 aerial photos indicate these areas were historically conifer. as being high risk. One area is young conifer and should receive treatment to insure growth of large trees. The other area is a possible conversion or release and should be ground truthed.




29-11-07, John's Creek: One potential area for release or conversion. In 1950 most of the area hadn't been disturbed.




28-11-19, Wimer Creek: Two areas identified as being "high risk for non-attainment of large wood to the stream. The 1950 aerial photographs showed those areas original stocked with conifer.

**References**

Bisson, P.A.; Bilby, R.E.; Bryant, M.D.; Dolloff, C.A.; Grette, G.B.; House, R.A.; Murphy, M.L.; Koski, K.V.; Sedell, J.R. 1987. *Large woody debris in forested streams in the Pacific Northwest: past, present, and future*. In: Salo, E.O.; Cundy, T.W., eds. *Streamside Management: Forestry and Fisheries Interactions. Contribution Number. 57.* Seattle, Washington: University of Washington, Institute of Forest Resources. 143-190.

USDI. 1997. *Middle Main Coquille/ North Fork Mouth/ Catching Creek Watershed Analysis*. on file Coos Bay Dist. Office.